

REMARKS

The Office Action of March 7, 2007 has been received and carefully reviewed. It is submitted that, by this Amendment, all bases of rejection are traversed and overcome. Upon entry of this Amendment, claims 49-55 and 63-71, 73, 75, 77 and 79-85 remain in the application. Claims 72, 74, 76 and 78 are cancelled herein without prejudice. Reconsideration of the claims is respectfully requested.

Claims 69-70 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Brecht (U.S. Publication No. 2005/0197431). Regarding claim 69, the Examiner states that Brecht discloses the use of a three-dimensional printing technique that applies multiple layers, that can be ceramic, to make the three-dimensional form. A reaction retardant of sodium phosphate is used as well as the particulate, calcium phosphate.

Independent claim 69 has been amended to recite that the composition includes a particulate blend with a single source of calcium phosphate, a reaction retardant, a layered double hydroxide, a polyacid, and a reaction accelerant; a solubilizing binder that dissolves calcium phosphate of the single source of calcium phosphate; and reprecipitated calcium phosphate formed from the dissolved calcium phosphate. Support for these recitations may be found throughout Applicants' specification as filed, at least in paragraph [0025].

The reprecipitated calcium phosphate as recited in Applicants' amended claim 69 is different from the calcium phosphate from which the reprecipitated version is formed. As provided in paragraph [0025] of Applicants' specification as filed, upon mixing the calcium phosphate source with the binder, the calcium phosphate (from the source) dissolves and reprecipitates into a **less soluble calcium phosphate**. During the reprecipitation reaction, the precipitating calcium phosphate crystals grow and become entangled, thereby **increasing mechanical strength**. Generally, the reprecipitated calcium phosphate is of a higher order form than the calcium phosphate source (see paragraph [0047]). As such, Applicants' composition as defined in claims 69 and 70 includes **reprecipitated** calcium phosphate.

In sharp contrast, the product described by Bredt includes calcium phosphate, **not reprecipitated calcium phosphate**. Bredt teaches that a calcium carbonate powder is reacted with a sodium hydrogen phosphate solution to form calcium phosphate (see paragraph [0070] of Bredt). Bredt neither teaches nor suggests that the calcium phosphate formed from this reaction is reprecipitated. Furthermore, the use of reprecipitated calcium phosphate (as recited by the Applicants) would not be obvious in view of Bredt because Bredt teaches that his calcium phosphate adequately “cements together the grains of the powder”.

In addition to Applicants’ and Bredt’s products containing different forms of calcium phosphate, Applicants submit that the mechanical strength of the two products is also different. It is submitted that one skilled in the art would be cognizant of the fact that the reaction used by Bredt to form calcium phosphate results in the formation of water and carbon dioxide in addition to calcium phosphate. The Applicants submit that such by-products would likely result in the formation of voids, thereby producing a relatively weak product. This weak calcium phosphate-containing product (of Bredt) is in sharp contrast to the Applicants’ composition as defined in claim 69, which includes a reprecipitated calcium phosphate that is mechanically stronger and less soluble than the type of calcium phosphate described by Bredt.

Still further, the composition recited in Applicants’ claim 69 includes a reaction retardant in the particulate blend. The Examiner asserts that the humectant of Bredt is equivalent to a reaction retardant. Applicants respectfully disagree. In one embodiment of Bredt, a humectant is included in the activating fluid, which is used to “infiltrate the insoluble or semi-soluble particle mixture and to bond the grains together” (see paragraph [0063] of Bredt). As such, one skilled in the art would not be led to believe that the humectant included in the activating fluid is a reaction retardant as recited and defined by the Applicants. In another embodiment of Bredt, a humectant is used to retard evaporation and to prevent drying/clogging of the printhead. One skilled in the art would be cognizant of the fact that a humectant is “a substance that promotes retention of moisture” (<http://mw1.merriam-webster.com/dictionary/humectant>). In sharp contrast,

Applicants' reaction retardant (as defined in the specification as filed) modifies the pH of the particulate blend to prevent premature reactions (see paragraph [0028]). Without any further explanation, one cannot glean from Bredt that the humectant is a "reaction retardant" as recited and defined by the Applicants.

Bredt also fails to teach an accelerant.

For all the reasons stated above, it is submitted that Applicants' invention as defined in claim 69, as well as in claim 70 which depends therefrom, is not anticipated, taught or rendered obvious by Bredt, either alone or in combination, and patentably defines over the art of record.

Claims 49, 51, 53-55, 63-68, 72, 74-81 and 84-85 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Bredt, and further in view of Nichols (U.S. Patent No. 5,952,093). Regarding independent claim 49, the Examiner states that Bredt does not teach the use of a layered double hydroxide (LDH), but that Nichols teaches the use of LDH in the layering of materials to make an inorganic layered material to be used as a reinforcing agent. The Examiner concludes that it would have been obvious at the time of the invention to combine the layered three-dimensional structure and composition of Bredt with the use of LDH by Nichols to develop a composition that has a great resistance to heat and chemicals and enhanced stiffness.

Applicants have amended claim 49 to recite that the pre-ceramic includes a reaction retardant, a layered double hydroxide, a polyacid, and an accelerant, in addition to the single source of calcium phosphate which forms reprecipitated calcium phosphate. For the reasons provided hereinabove, Applicants submit that Bredt does not disclose all elements of amended claim 49. Furthermore, Nichols fails to supply the deficiencies of Bredt, in particular, Nichols fails to teach or suggest at least the reprecipitated calcium phosphate and the reaction retardant. As such, it is submitted that Applicants' invention as defined in the listed claims is not anticipated, taught, or rendered obvious by the cited references, either alone or in combination, and patentably defines over the art of record.

Claim 50 stands rejected under 35 U.S.C. 103(a) as being unpatentable over Bredt, Nichols, and further in view of Kelly (U.S. Patent No. 5,676,745). The Examiner states that neither Bredt nor Nichols teaches the making of three-dimensional ceramic objects with calcium hydroxyapatite and a binder, but that Kelly does. The Examiner concludes that it would have been obvious to a person of ordinary skill in the art at the time of the invention to combine the calcium phosphate with a binder of Bredt with Nichols' use of LDH in the layering materials with the use of calcium hydroxyapatite and a binder of the Kelly reference, to make a simplified, lower cost, low temperature method of fabricating ceramic materials.

For the reasons provided above, Applicants submit that the combination of Bredt and Nichols fails to teach Applicants' invention as defined in claim 49, from which claim 50 depends. It is also submitted that Kelly fails to supply the deficiencies of these references. In particular, Kelly fails to teach the reaction retardant of Applicants' claim 49. Furthermore, it is submitted that one skilled in the art would not be led to include a reaction retardant in Kelly's composition, in part because the desired reaction of Kelly is controllable (see Col. 3, lines 14-24). As such, it is submitted that the invention as defined in claim 50, which directly depends from claim 49, is not anticipated, taught, or rendered obvious in view of the cited references, either alone or in combination, and patentably defines over the art of record.

Claim 71 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Bredt, in further view of Kelly. The Examiner states that Bredt teaches the use of calcium phosphate but does not specifically use the term hydroxyapatite. However, Kelly teaches the making of three-dimensional objects with calcium hydroxyapatite and a binder. The Examiner concludes that it would have been obvious to a person of ordinary skill in the art at the time of the invention to combine the calcium phosphate with a binder of the Bredt reference with the use of calcium hydroxyapatite and a binder of the Kelly reference, to make a simplified, lower cost, low temperature method for fabricating ceramic materials.

Applicants reiterate the arguments set forth above in response to the rejections of claims 69 and claim 49, and submit that Kelly does not supply the deficiencies of Bredt. As such, it is submitted that the invention as defined in claim 71, which directly depends from claim 69, is not anticipated, taught, or rendered obvious in view of the cited references, either alone or in combination, and patentably defines over the art of record.

Claims 66, 72 and 73 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Bredt, Nichols, and further in view of Goodson (U.S. Pat. Publication No. 2002/0009622). The Examiner states that neither Bredt nor Nichols teaches the specific use of the accelerants lithium phosphate, aluminum nitrate or iron nitrate. Goodson, however, teaches a phosphate cement coating that uses accelerants, specifically aluminum nitrate. The Examiner concludes that it would have been obvious to a person of ordinary skill in the art at the time of the invention to combine Bredt and Nichols with Goodson so as to provide a three-dimensional printing technique with layered double hydroxides that uses an accelerant such as aluminum nitrate to provide instant densification of the phosphate cement through an exothermic reaction brought on by the introduction of the aluminum nitrate.

Applicants again reiterate the arguments provided above in response to the rejection of claims 49 and 69, and submit that Goodson fails to supply the other deficiencies of Bredt and Nichols. As such, it is submitted that the invention as defined in claim 66, which directly depends from claim 49, and claim 73, which depends from claim 69, is not anticipated, taught, or rendered obvious in view of the cited references, either alone or in combination, and patentably defines over the art of record.

Applicants note with appreciation the allowance of claims 52, 82 and 83.

In summary, claims 49-55 and 63-71, 73, 75, 77 and 79-85 remain in the application. It is submitted that, through this Amendment, Applicants' invention as set forth in these claims is now in a condition suitable for allowance.

Appln. S.N. 10/696,335
Amdt. dated June 5, 2007
Reply to Office Action of March 7, 2007
Docket No. 200313765-1
Page 13 of 13

Further and favorable consideration is requested. If the Examiner believes it would expedite prosecution of the above-identified application, he is cordially invited to contact Applicants' Attorney at the below-listed telephone number.

Respectfully submitted,

DIERKER & ASSOCIATES, P.C.



Julia Church Dierker
Attorney for Applicant(s)
Registration No. 33368
(248) 649-9900, ext. 25
juliad@troypatent.com

3331 West Big Beaver Rd.
Suite 109
Troy, Michigan 48084-2813
Dated: June 5, 2007
JCD/AMS/JRK/hmp